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CONTENTS

SCIENCE POLICY

TRANSPORTATION

SOLAR ENERGY COMMISSION CONCENTRATES ON BIOMASS

Paris L'USINE NOUVELLE in French Apr 82 pp 11-12

/Article by Pierre Laperrousaz: "Renewable Energies: COMES is Backing Biomass"/

> /Text/ Methanization of animal wastes, burning of straw, and production of fuel by butyl acetone fermentation of the sugar from Jerusalem artichoke: the three main headings chosen by COMES for developing biomass, which will constitute the major renewable energy source from now until 1990.

Biomass is still the preferred approach for the exploitation of renewable forms of energy. The programs announced by Guy Lefrancois, the new director general of COMES (Solar Energy Commission), at the recent Agriculture Show leave no doubt on this point. From now until 1990, renewable forms of energy will contribute 10 to 14 Mtoe /million tons of oil equivalent/ to the nation's energy balance; biomass will take the lion's share, with 7 to 11 Mtoe. To attain this objective, COMES plans to support the development of three main "subapproaches": methanization of animal wastes, burning of straw, and production of a substitute fuel from Jerusalem artichoke.

Animal wastes represent a potential 7 Mtoe in the form of biogas, of which it is hoped to recover 20 percent (or 1.4 Mtoe) from now until 1990. Already there are several dozen methanization digesters in service on farms. But for the most part they are individually crafted and have the drawback of not operating continuously. That is why in 1981, COMES, in association with ANVAR /National Agency for the Valorization of Research/ and the Ministry of Agriculture, arranged for consultation with manufacturers for the development of digesters which would handle liquid manure, barn wates, and droppings and would be reliable and economically acceptable to the agricultural community.

Of 51 systems offered, 15 have received interim approval and will be tested for about a year on 15 different sites scattered throughout the country. Almost all of these digesters operate in a continuous manner and satisfy the economic conditions set forth in the request for bids: that the investment cost per ton of oil equilvanet of fuel produced should be between Fr 10,000 and 15,000, on the assumption that 50 units would be sold, which would ensure

an amortization over 5 to 8 years. But the manufacturers have had to take advantage of economies of scale to stay within the limits of the design plan, with the consequence that the digesters receiving approval have large capacities (fermenters larger than 100 m^3 for a production output exceeding 25 toe/year), and are thus overdimensioned relative to the needs of a medium-size farmholding.

Straw Could Furnish 2 Mtoe

Another sticking point for COMES is that the proposed systems are designed primarily for the treatment of liquid manure and largely neglect barn wastes and droppings, which because of their solid character are not as suitable for continuous fermentation (the only available systems do not operate in a continuous manner). So it is not inconceivable that a new request for bids will rechannel the research toward handling such solids (and toward smaller units). Be that as it may, Guy Lefrancois is optimistic: "In 1982-1983, some 100 digesters will be installed, and once that induction phase is over, the diffusion phase will begin."

As the second major thrust of the COMES program, straw could furnish a little more than 2 Mtoe, not including existing agricultural uses (leaf litter, burial, etc.). Burning is the most direct way to utilize this energy resource. This is what COMES aims to promote by issuing a request for bids among manufacturers capable of developing equipment for the combustion, handling, etc., of conditioned or unconditioned straw for domestic and industrial uses, in a power range from 20,000 to 100,000 kcal/hour.

The Jerusalem artichoke program could require a much longer time frame and mobilize many more resources, both agricultural and industrial. Indeed, to produce the 1.5 to 2 Mtoe projected by COMES for 1990, it would be necessary to put about 500,000 hectares into cultivation, to select varieties, to evaluate their performance, to design machines to harvest the tubers and haulm, and develop the process for converting inulin (the sugar contained in Jerusalem artichoke) into alcohol.

On the agricultural level, 40 individual 10-hectare sites located in various regions of France will be farmed, beginning this year. The plots will also serve for the testing of harvesting equipment. On the industrial level, a pilot plant to be built in 1982-1983 at Attin (pas-de-Calais) will supply 10 tons/day of butyl acetone mixture from 200 tons of tubers. Its startup will cost Fr 60-70 million. The whole program, including the cost of operating the pilot plant from 1982 to 1986 and of priming the pump for the basic research on the butyl acetone fermentation, will come to Fr 110-120 million and should culminate in a 120-ton/day industrial unit by 1984-1985. Meanwhile, a parallel technical-economic study will be conducted to determine the best approaches for getting additional energy from byproducts (haulm, distillery wash) so as to improve the overall energy balance of the process.

"Direct" Solar Energy Must Not Be Neglected

This accent on biomass does not mean, though, that "direct" solar energy is to be neglected. Though activity in this area dropped off in 1981 (60,000 m^2 of flat heat collectors installed, versus 64,000 the year before), the 1982 results should gladden the hearts of solar energy enthusiasts. According to Guy Lefrancois, the projects supported by COMES alone this year will account for 30,000 to 40,000 water heaters, or 75,000 to 100,000 m^2.

But French production capacity still remains underutilized, particularly as new manufacturing plants come into existence. Thus, since the first of the year, Sovirel-Equipements (of the Corning group) has been manufacturing on a semi-industrial scale 150 m^2 of collectors per month at its plant in Anniche. But these collectors have tubes which operate under vacuum, giving efficiencies some two to three times higher than that of the conventional flat collectors. This special advantage will perhaps enable them to better fit the needs of a country which is not exactly known for an abundance of sunshine.

9828
CSO: 3102/286

BONN: REPORT ON BASIC RESEARCH IN PLANT GENETICS

Bonn RHEINISCHER MERKUR in German 21 May 82 p 14

[Article by Michael Globig: "Life With Foreign Genes"]

[Text] Many techniques and procedures devised by man are considered dangerous, because they do not exist in nature and seem to represent interference in natural processes. These fears relate to both nuclear fission and genetic manipulation. However, 10 years ago French scientists discovered that nuclear fission is by no means an exclusively artificial process. Uranium found in the Oklo mines of Gabun and Equaotrial Africa has a totally atypical composition that can be explained only if one supposes that natural nuclear chain reactions occurred there 2 billion years ago.

It is similar with genetic manipulation. Until a few years ago the techniques of transferring hereditary information from one organism to another, thus giving it totally new characteristics (for example, giving bacteria the capability of producing human insulin), was considered a trick possible only in the laboratory. But in that same decade in which scientists made such progress in refining the methodology of genetic manipulation other researchers discovered that nature had probably been using the very same procedures for millions of years. It can be assumed that in the course of evolution the multitude of species developed not only through mutation, but also by means of genetic transfer from one organism to another.

At this year's annual general meeting of the Max Planck Society, which at the invitation of the Federal Government took place in Bonn for the first time, the director of the Cologne Max Planck Institute for Improvement Research, Belgian Prof Jozef Schell, reported on this important development and its consequences.

A bacillus (agrobacterium tumefaciens) attacks injured plants--legumes, tomatoes and fruit trees--and causes a tumorlike growth, the "root-neck gall." More precise investigation of this process, in which Prof Schell also played an important part, showed that the agrobacteria thereby transfer to the plant a ring-shaped piece of genetic material (a so-called plasmid), which introduces itself into vegetative chromosomes there.

But the genes introduced into the plants control not only tumor growth, but they also cause the plant to produce a rare variety of protein building block (so-called opines). The plant itself cannot use these opines. Therefore, it releases them, indeed it releases them directly into the region in which the tumor is developing. There they are taken up by bacteria, broken down by enzyme action and used to meet bacterial nitrogen requirements.

In the same way that researchers today isolate human genes, on which are coded the instructions for insulin production, and then introduce these genes in bacteria in order to induce the bacterium to produce insulin--the agrobacterium tumefaciens acts exactly the same way: It introduces its genetic material into the plant and causes it to produce certain substances needed by the bacterium for sustenance.

Nature and researchers alike thereby employ the same vehicle to introduce genetic information into another organism--namely that of the plasmid. Such ring-shaped structures comprised of genetic material (DNS) are not, in contrast to the chromosomes, of direct significance for the survival of the bacterial species, but they can carry information that becomes important under certain conditions. An example would be the instructions to deactivate antibiotics, thus developing a resistance to these substances.

Scientists also recognized that it is relatively easy to isolate such plasmids and introduce them into foreign bacteria. Since they can also be split with the help of an appropriate enzyme, and in place of the excised piece one can introduce other genes into the gap, they are the ideal instrument for gene manipulation.

Plant improvement researchers are not investigating the possibility of using the natural process to develop new plant varieties. For the procedure of crossing different varieties primarily used for this purpose heretofore requires decades before a new variety can be selected and introduced into agriculture. At the start of the 1960's an intensive improvement program was begun worldwide, principally to increase yields for corn, wheat and rice. But despite the massive use of know-how and capital, it was still not possible to double production--a meager result in view of the explosive growth in world population. Therefore, new plant improvement methods that produce results more quickly are urgently needed.

Thus far research on the transfer of bacteria to plants, in part also performed at the Cologne Max Planck Institute, has produced three important findings: One can incorporate foreign genes into bacterial plasmids without affecting the plant's capacity later to combine parts of this plasmid with its own chromosomes. The foreign genes introduced into the plant in this way take effect there. And: The bacterial genetic information responsible for the tumor growth can be deactivated.

Thus, three important preconditions are met for future experiments in transmitting new genetic commands to plants with the help of bacterial plasmids. Examples are instructions to develop a resistance to certain diseases (which would reduce the use of plant protection agents) or the program to combine and use nitrogen directly from the air (which would mean less use of fertilizers).

In conjunction with its annual general meeting in Bonn, the Max Planck Society has signed a cooperative agreement in this important area of plant genetics with the Bayer Works in Leverkusen. The Bayer chemical concern provides the Cologne Max Planck Institute for Improvement Research DM 3 million without restrictions. And in exchange Bayer is permitted to send its employees to the newly established departments "basic genetic research in plant improvement" and "molecular plant genetics." Thus, on the one hand the research capacity of the Max Planck Institute is expanded, and on the other hand the company's scientists receive know-how that they can then use in their enterprises. According to Prof Reimar Luest, president of the Max Planck Society, the contract could be indicative in the same way as the agreement between Hoechst Farbwerken and Massachusetts General Hospital in Boston on collaboration in gene technology.

But the Cologne research work and the resulting contract also show that the scientists are quite aware of their social responsibility--a responsibility emphatically demanded by Federal Chancellor Helmut Schmidt at the annual general meeting. To be sure, they do perform basic research, but they never lose sight of the application of science in society, that is, the future significance of their research.

9746
CSO: 3102/306

BIOTECHNOLOGY

BRIEFS

GENETIC ENGINEERING LABORATORY--Milan--Farmitalia Carlo Erba, a subsidiary of Montedison, this year will invest "substantial sums" in startup of a genetic engineering laboratory. This laboratory will make it possible to extend the research program that has been pursued for a long time in collaboration with the Institute of Biochemical and Evolutionary Genetics of the CNR [National Research Council] of Pavia. Farmitalia Carlo Erba is thus expanding its commitment in biotechnology and will substantially increase its research on human interferon, monoclonal antibodies, and plant cell culture. In 1981, Farmitalia Carlo Erba dedicated a sum of 44 billion lire (about Fr 220 million) to the research, and it now employs 1,290 persons in this activity. [Text] [Paris CHIMIE ACTUALITES in French 9 Apr 82 p 1] 9828

CSO: 3102/286

WORLD'S FASTEST 16K CMOS RAM MARKETED BY MATRA HARRIS

Paris ELECTRONIQUE ACTUALITES in French 1 Apr 82 pp 14, 16

[Article by J. B.]

[Text] The marketing of the world's fastest CMOS static RAM by Matra Harris Semiconductors (MHS) demonstrates that innovation capabilities in microelectronics are not limited to the United States and Japan. This memory offers a remarkable speed/consumption compromise together with a reduced industrialization cost; it will find a vast outlet in all applications in which a rapid logic is necessary.

Organized into 2084 8-bit words, the HM 6516 memory is fabricated by the MHS CMOS SAJI IV double silicon layer process, using 3 micron lithography on a 24.7 mm-square chip. Asynchronous, in a 24-pin package, it is compatible with the 2716 EPROM; three versions are offered to cover commercial, industrial, and military applications, in a ceramic or plastic package.

Its major characteristics (40 ns typical, 55 ns maximum address access time; maximum consumption of 500 microW in standby, and 30 mW in operation) will allow it to compete effectively against rapid TTL logic, whether in microcomputers, instrumentation for digital data recording--with the passband going from 10 MHz to 20 MHz--or all portable equipment. On the commercial level, MHS's technical mastery, which allows it to place an original product on the market, assure it of sales at prices which will return a suitable profit in the midst of a market where the Japanese pressure forces Western firms to support marketing without profit.

In technical terms, the circuit is built on an N-type substrate which supports the P-type framework of N-channel transistors; this is a conventional approach, selected instead of a P-type base for the natural protection it offers against radiation, and especially against particles. The basic memory cell includes a four-transistor bistable NMOS and two resistances, resulting in a surface gain, higher speed, and reduced consumption, compared to conventional six-transistor CMOS cells. The memory is organized into two half-planes adding up to 128 rows of 128 columns; the read amplifiers are built to offer the best compromise between speed, high gain, and good rejection. The output buffers are CMOS, assuring compatibility with TTL or CMOS; access times close to 40 ns are obtained for capacitive loads reaching 100 pF.

In addition to the 2K x 8, several packages will soon be placed on the market: a 16K x 1 and a 4K x 4 memory, as well as a 1K (256 x 4) version, all of them in CMOS. Together with finer etching, the SAJI IV process should make it possible to soon market a 64K rapid CMOS package.

11,023
CSO: 3102/274

ELECTRONICS

ELECTRONICS PLAN AIMS AT MAKING FRANCE NUMBER THREE IN WORLD

Paris LES ECHOS in French 13 May 82 p 7

[Article by Jacques Jublin]

[Text] "If France had to practice a world strategy in only one industry, it should choose electronics." In a nutshell, this is the strategic advice offered to the government by the electronics industry task force, in the report that it has just delivered to Jean-Pierre Chevenement. Because whoever controls electronics controls the future of components, computers, telecommunications, telematics, instrumentation, and brain power, as well as the future of industry, which will be the source of jobs, of monetary resources, and of added-value. Tomorrow, the first industry in the world will no longer be automobiles, and electronics will be predominant. And France holds a fantastic trump card, since it is presently already the fourth in the world, with 5.8 percent of the production, following FRG (8 percent), Japan (16 percent), and the United States (45 percent).

This is a national salvation project, since the 1981 balance of trade resulted in a 3 billion franc deficit, while the United States amassed 20 billion francs in currency and Japan 64 billion, selling their electronics around the the world.

A national salvation project to the point where Jean-Pierre Chevenement asks for 20 billion francs in 1986 for studies, research, and development in these leading edge disciplines, compared to 12 billion in 1980, thereby adopting the viewpoint of Abel Farnoux, leader of the electronics industry task force: "All the sectors of electronics are by now interdependent, which was not the case 20 years ago. And this synergy will continue to grow."

To which he adds: "France must refuse to settle for a 'slot' policy. It must implement an overall strategy of revival, which begins with the development of such strong points as professional equipment, telecommunications, and telematics. It will then undertake efforts to close the gap in office computerization, automation, consumer goods, and components."

The "Red, White, and Blue" electron is worth 95.9 billion francs

Products and systems	Million 1981 francs	Percentage
Components	11,400	12
Consumer electronics	5,400	6
Measurements, control, and regulation	4,310	4
Medical electronics	1,130	1
Professional electronics	19,110	20
Telecommunications	14,800	15
Subtotal	39,350	41
Automation	2,600	3
Computers	26,400	28
SSCI (computer information and assistance companies)	10,500	11
Subtotal	36,900	39
Office equipment	220	0.2
Total	95,870	100

Source: DIELI, Ministry of Industry (temporary figures)

Three billion francs of trade deficit (in millions of 1981 francs)

Products and systems	Importations	Exportations	Balance
Active components	3,920	3,710	- 210
Passive components	3,800	3,120	- 680
Components subtotal	7,720	6,840	- 880
Radio and TV	2,930	640	-2,290
Sound systems	4,360	730	-3,630
Consumer products subtotal	7,290	1,370	-5,920
Measurement, control, regulation	2,640	2,150	- 490
Medical	1,250	1,030	- 220
Professional electronics	1,580	9,550	+7,970
Telecommunications	670	1,910	+1,240
Miscellaneous	2,270	2,590	+ 320
Subtotal	8,410	17,230	+8,820
Automatic devices	not avail.	not avail.	- 500
Computers	10,940	9,220	-1,730
SSCI	not avail.	not avail.	+1,600
Office machines	3,620	740	-2,890
Grand total	37,980	35,390	-1,500

Source: DIELI (temporary figures expressed in FOB prices)

These figures appear to underestimate the trade balance deficit in several segments of the sector, and particularly in the automatic devices sector. The total deficit would actually be not 1.5 billion francs, but rather of the order of 3 billion francs.

3 percent of the gross domestic product compared to 3.7 percent for Japan
(in billion francs)

3 % du PIB contre 3,7 % au Japon
(en milliards de francs)

PAYS (A)	Production	%	Marché (B)	%	Solde commercial (C)	(D) Part de la Filière Elec. dans le PIB du pays
ETATS-UNIS . . . (E) .	668	46	648	45	+ 20	3,5 %
JAPON . . . . (F) .	228	16	164	11	+ 64	3,7 %
EUROPE DE L'OUEST . .	379	26	409	28	— 30	
dont — RFA	113	8	113	8	—	3,3 %
— FRANCE	83	6	82	6	— 1	3,0 %
(G) — G.B.	74	5	75	5	— 1	3,8 %
Autre pays (1) . . (H) .	175	12	229	16	— 54	
Monde (1) . . . . (I) . .	1.450	100	1.450	100	—	

Source : DIELI — FIEE

Key: (A) Country
(B) Market
(C) Trade balance
(D) Part of electronic sector in country's gross domestic product
(E) United States
(F) Japan
(G) Western Europe: FRG
France
Great Britain
(H) Other countries
(I) World

Source: DIELI-FIEE

From Laboratory to Market

This future implies a total modification of procedures and mentalities in research and the national industry. Abel Farnoux categorically states: "We must end sectorial mini-plans, patching, and scatter. And because there is not enough money, we must carry out a horizontal policy which associates researchers, industrialists, business, and educators." How?

By means of 14 large "national projects," from big computers to audiovisual devices, and passing through integrated circuits and computer-assisted teaching. These are almost task forces gathered around well-defined technologies, with a product concept designed around a technique based on market needs, also incorporating production and distribution methods.

This is indeed a kind of revolution, that the task force is proposing, so that the 49 percent nationalized electronics will not fall into the traps of bureaucracy and centralization. Otherwise, the impetus will founder in an administrative morass.

The prescription is applied research supported by basic brain power, with specialists in the field. After all, Japan trains nine times more electronic engineers, and the United States three times more, than France.

12,000 Specialists Right Away

These are such critical gaps that the task force is suggesting the establishment of major higher education schools in computer science, automation, audiovisuals, and components, such as the ones that exist in telecommunications.

This is so urgent, that the first recommendation is to take vigorous action to train 12,000 persons, including 10,000 technicians, within 30 months (the electronics sector employs 300,000, or 500,000 if we include subcontractors and suppliers). France may not lack ideas, but does sorely lack know-how for their judicious development.

This is an international challenge. "But," as Abel Farnoux cautioned, "we must be realistic. The challenge can only be met at the level of the Common Market. We must give priority to European collaborations. In any case, the EEC market as a whole represents nearly 30 percent of the world's outlets, and is on the way to becoming the leading purchaser in such fields as audiovisuals. The stakes are so high, that if they fail to unite, the Europeans will have to submit to the domination of Japan and the United States."

This is a full-scale battle plan at the very moment when the government is formulating an industrial policy for this sector, which is bound to have repercussions as far as the Elysee, where Francois Mitterand's ambition is to make France "the third electronics power in the world."

11,023
CSO: 3102/274

REVIEW OF FRG COAL GASIFICATION, LIQUEFACTION ACTIVITIES

Duesseldorf BWK: BRENNSTOFF-WAERME-KRAFT in German Apr 82 pp 170, 171-173

[Excerpt] Coal Gasification

Natural gas has acquired great importance as an energy source and a chemical raw material because of its ease of handling and transportation, absence of pollutants and the many possibilities for its use. In 1981, just under $60 \cdot 10^6$ tons SKE [standard coal units] were consumed in the FRG. The existing dependence on imports for supply and the continuing decline in domestic production resulted in efforts to develop methods for the production of alternative gaseous fuels, while taking existing consumption patterns into account [76-83].

Starting from classical methods, the main points of the program are optimizing process control, increasing specific gasifier output, attaining a high degree of flexibility with respect to the range of coals used and developing components (coal conveying and feed systems, ash removal, heat reclamation) [84,85]. These developments are being supplemented by basic research [86-88].

The operation of a number of pilot plants has provided valuable experience in the interim. The demonstration plant for the Texaco powdered coal gasification process (Oberhausen-Holten, Ruhrkohle AG and Ruhrchemie AG), which has been in operation since 1978, has now produced about 10^9 m^3 of product gas (normal) in approximately 10,000 hours of operation; 11 varieties of coal were used successfully [48]. An additional process for pressure-operated powdered coal gasification is being tested with the Shell pressure-gasification process (Hamburg-Harburg; Deutsche Shell AG) [89, 90]. In addition, a powdered coal gasification plant based on a slag bath gasification process is in operation in the Saarland (Voelklingen, Saarberg + Dr C. Otto GmbH) [91].

The gasification of lump coal in a revolving grate generator to produce a clean gas largely free of byproducts is being developed using the KGN [acronym not identified positively] process [92]. A large-scale pilot installation is in operation for the continuing development of the pressure-gasification of lump coal as part of the "Ruhr 100" project (Dorsten, Ruhrkohle AG, Ruhrgas AG, Steag) [93]. Coal gasification in iron smelting is the basic idea behind the Humboldt coal gasification process [94]. In another pilot plant, the production of synthesis gas is being demonstrated, using the high-temperature Winkler process (HTW) (Frechen, Rheinische Braunkohlenwerke AG) [95,96]. The construction of a plant for the production of

10^9 m^3 of synthesis gas annually (Huerth-Berrenrath) has been approved and started [97]. A new direction in development is emerging in the combination pressure-gasification process (CGT) [acronym not identified positively] [98]. The VEW [United Electricity Works] coal conversion process is also undergoing further development. Construction of a pilot plant for pressure processes will begin soon (Werne, Gersteinwerk).

Besides the conventional methods, allothermic processes are also being developed in the FRG, in which the reaction heat required for gasification is provided by nuclear process heat [99,100]. Pilot plants for the gasification by hydrogenation of brown coal and for the steam gasification of bituminous coal have been operating successfully for several years [101].

As part of the government's coal conversion program, a number of project proposals have been presented by German industry for large-scale gasification [8]. These proposals, which are based on various processes, are nearly all directed toward the production of synthesis gas. The coal capacity of the proposed plants is between 0.3 and $0.9 \cdot 10^6$ tons annually. Funds totalling DM $1 \cdot 10^9$ are set aside in the budget of the Minister for Economics until 1985 for the subsidization of industrial coal gasification.

Exploitation of coal deposits which cannot be mined conventionally by using in situ gasification is the idea on which the work to develop underground gasification is based [102-104]. A joint test is in preparation near Thulin, Belgium, as part of German-Belgian cooperation in this field.

The addition of a pyrolosis process as the prestage to coal gasification or combustion is being studied with a view to recovering coal products at the very outset [106,107]. The objective of another line of development is the direct conversion of coal to gaseous hydrocarbons [108].

Coal Liquefaction

Two processing routes are possible to produce coal-based liquid products which can be substituted for those obtained from crude oil [109]. They are the direct high-pressure hydrogenation of coal and the sythesis of hydrocarbons from synthesis gas on a coal base [110]. The emphasis in the work in the field of hydrocarbon sythesis is on the production of methanol, which is converted catalytically into hydrocarbons, and on the development of product-specific catalysts.

Based on the method of direct hydrogenation in the symph phase [expansion unknown] (Bergius-Pier process), three plants affiliated with technical universities began operation in the FRG in the 1970's [111,112]. Coals from different sources are used there, the products obtained are analyzed and tested with respect to the possibilities of further use [113-115]. On the basis of the data generated in these plants, two large-scale test facilities have been built. These facilities, one of which is near Voelklingen, in the Saarland, and the other in Bottrop, have now begun operation [48,116].

As a step toward bringing about coal liquefaction on a large scale, the industry submitted four proposals for major projects to the government in the past year [8],

all of which are based on the direct hydrogenation of coal [117]. A decision concerning the implementation of these projects is expected following evaluation of the planning studies submitted in their support. For the time being, a component development program is planned.

German participation in foreign projects continues as part of the international collaboration in the field of coal liquefaction. Ruhrkohle AG is participating with VEBA [United Electricity and Mining Corporation] Oel AG in the "Catlettsburg Coal Oil Plant," with subsidies from North-Rhine Westphalia. The plant started operation in 1980. Ruhrkohle AG is also a partner in the "Baytown Coal Oil Plant" project; the German sharte is being supported by the Minister for Research and Technology. This plant, which uses a two-stage, hydrogenizing extraction process, has been in operation since 1980 [48, 118]. In addition, a German consortium carried out a feasibility study on the optimal conversion of Australian coal into fluid engine fuels on the basis of German technology [119]. The SRC II major project (Morgantown, United States) is not proceeding, following a decision by the U.S. government.

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FIRST 'CAX' ENGINEERS GRADUATE FROM UNIVERSITY

Paris L'USINE NOUVELLE in French supplement to 13 May 82 issue p 13]

[Article by Jean-Claude Streicher]

[Text] One small event is scheduled for the Compiegne University of Technology: in June, at the 10th anniversary of the founding of this facility, 12 students will be the first to receive a diploma with no equivalent anywhere else in France--the diploma of CAX engineer. (The "X" means that they will be able to provide a computer-aided--CA--system for any phase in the life cycle of an industrial object: from design to maintenance, including conception, manufacturing, and production).

These modern-day "renaissance men" will be able to handle a "computer-aided anything" even when it does not yet exist. At a time when all industrial sectors are being affected by the information revolution, they will be the experts, whose services will be in great demand.

PME [Small and Medium Businesses] in agriculture and food processing, public services, research offices, or business management--there is nothing that should cause them problems. "Our engineers will be interface men," explains Bernard Dubuisson, the director of the applied mathematics and data processing department at Compiegne. "They will provide the essential link between the user and the information system."

In medium-sized enterprises, their role will be to define the needs which can be met, to determine the materials and systems which should be used, and to handle their acceptance, followup, and later development, up to and including robotics. In large enterprises, the CAX graduates will work with already established groups working on major projects. They will serve as the link between the director of fabrication and the data

specialist. In production, they will be able to define the simulation systems to be used. In quality control, they will determine the data acquisition and processing systems. The same is true for part selection. And the list could go on and on.

The training given the CAX engineers is obviously closely related to the skills they will need. The program lasts for a total of 5 years, 1 of which consists of two internship periods of 6 months each spent in businesses. The course begins with 2 years of a fairly general program, in which basic information courses are taught along with general requirements, such as modern languages, sciences, ergonomics, industrial organization, etc., as these courses will provide the foundation for the engineer's future multidisciplinary skills. The last 2 years are arranged according to units of value (22 in all). In information sciences, these are years of advanced work (system design, data bases, robotics, industrial sensors, etc.). But at the same time, the student is also given an opportunity to specialize in an area of his choice, such as mechanical engineering, chemical engineering, or biological engineering.

"At first," says Bernard Dubuisson, "our principle was to give everyone at Compiegne some rudiments of information science. But with the CAX diploma, the priorities were reversed: everyone does a lot of data processing at first, then a complementary field of specialization. So specializing in mechanical engineering can lead to the CAX degree."

Integrated and Flexible Preparation

The first real experimental work comes with the two internship periods. Some students during their internship developed a strip simulating the operation of traffic lights. Others, working at a nearby subprefecture developed a system to follow up administrative records. A third group developed nondestructive control systems or ADA simulation systems in Pascal language. Later on, some students may go to the United States for internship programs.

The training the CAX engineers are given is as integrated as it can possibly be. Most of them started with a solid mathematical and science background on a secondary level or were former UTC [United Technology Center] students. But other students were accepted, after their records were reviewed, who had a DUT [Technological University Diploma], a DEUG [General University Studies Diploma], or who were qualified for admission to the major technical schools. As this

field is not yet really stabilized, the program is also designed to be as flexible as possible. Its content is constantly changing, based on new applications which appear in industry. This obviously does not make the job of the instructors any easier. "It took us 3 years to develop our course structure," explained Michele Touzot, who is in charge of the course organization.

However, it is also true that the University of Compiege did not have to start from zero. Its contacts with industry enable it to be well aware of the needs of industry, and to prepare to meet these needs before everyone else.

The university president, Guy Denielou, says: "People in industry were always telling us: don't make your engineers too highly specialized, but make them sensitive to labor organization, because when projects fail, it is not really because of technical reasons, but because of organization problems." And Mr Denielou further explains that if the university is to realize its potential, "it must have a team of teachers who are basically in agreement with each other, not just isolated professors." At Compiegne, he feels they do have such teamwork.

After this first "crop" of 12 CAX engineers, the number of graduates will increase, semester by semester, to 24, 48, and then 72 graduates. But no more. At Compiegne, they call this a "controled increase in power."

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FLEXIBLE WORKSHOP OPERATING AT GERMAN SHEET METAL WORKS

Paris L'USINE NOUVELLE in French 13 May 82 pp 139-140

[Article by Patrick Piernaz: "Flexible Workshop, Ready for Sheet Metal Works"]

[Text] Metal sheets passing automatically from storage racks to machines, a workshop where two machining stations work at night without manual intervention, a robot tower... our special correspondent in Germany has found one of the first embryos of the "factory of the future" at the Trumpf works near Stuttgart.

"We wanted to show that the concept of a flexible workshop was applicable to sheet metal workshops," says Hans Juergen Sattler, production director of the German company Trumpf, while guiding our visit of the facility at Ditzingen, which has been running for a year in the worksho producing sheet metal for machine tools. This system, dubbed TMS, includes an automatic high-rise storage rack, two digitally controlled punch presses, one of which has a laser, and four transfer stations. The whole is serviced by a wire-guided cart.

An idea which radically reduces manual handling of the sheets, increases the rate of production, and saves 50 percent of the floor space. Automatization begins as soon as the sheets arrive on the unloading dock. The operator uses a keyboard to summon the wire-guided cart and indicate the differences in the sheets, their dimensions, and their number. These sheets are then automatically taken to the storage racks, which can contain 200 tons of steel sheets--it consists of 36 pallets supporting sheets whose dimensions range between 1,000 x 2,000 mm and 1,250 x 2,500 mm. "It was the storage racks which constituted the starting point of our effort," remembers H.J. Sattler. "We wanted to emulate food storage racks, but with the builder we had to develop a smaller structure (6.3 m) with microprocessor simplified controls and capable of supporting heavy loads: 3 tons per pallet."

Increase in the Operational Capability of the TMS System Foreseen

The storage racks are linked to two punch-presses by the wire-guided cart. The latter obtains the sheet metal packs and places them on a talbe in front of the machine. The automatic loader (Trumalift) for the punch-press then

takes the sheets one at a time to feed the machine. For the time-being, this system produces cut-out sheets intended for the productio of Trumpf machine-tools. It also serves as a display window for the manufacturer, who foresees selling similar systems ready to go. "The reduction of manual operations and downtime as well as the possibility of physically separating storage and production attracts our punch-press clients" emphasizes Hans Juergen Sattler. Several German and American companies, as well as a large French firm involved in building electrical components, are interested in the TMS system. At Trumpf, they foresee an increase in the operational capability of the TMS by doubling the storage capacity and adding a metal cutter to the two punch-presses.

This facility only constitutes a part of the automozation plans of this mid-size machine manufacturer (1,100 employees in Germany with total sales of 411 million francs), today one of the best equipped in Europe. In fact, since April 1981 the planning department has been using a computer assisted conception system, Computervision's CADDS 3, which produces both pneumatic and hydraulic schematics, tool designs, as well as designs for the sheet metal cut out on the punch-presses.

"We are preparing to switch soon to CFAO (computer assisted conception and production). We can then automatically edit the punch-tape intended for the digitally controlled machines," explains Tung Pham, the man in charge of computer assisted conception for Trumpf's planning department.

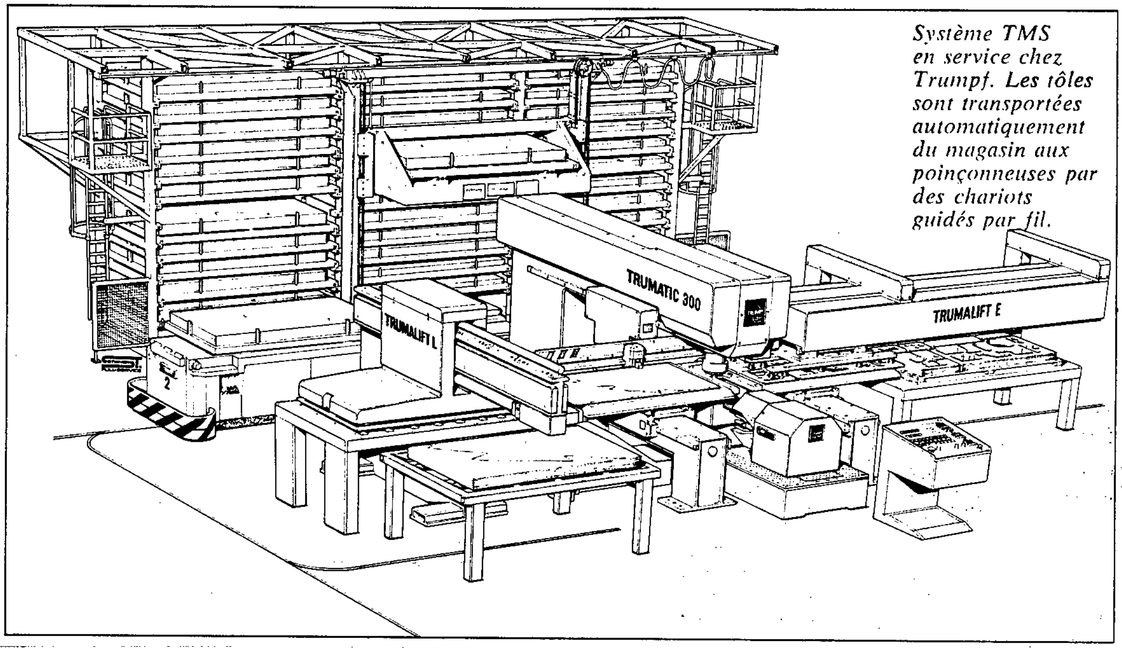
The machine-tool workshop consists of several automatic posts developed to run at night: a Burckhardt and Weber machining station with automatic paletting, an Index tower stocked by a Fanuc-Siemens robot, and above all a flexible production control room. "This control room was designed to run without human intervention during the third night shift," says Ewald Sprissler, production engineer. The operation consists of two Deckel DZ4 machining stations with a 50-tool stock, two cleaning stations, as well as a 20-pallet carousel for feeding the two machine stations.

The pallets are only used at night. During the day shifts, the supply of the machining stations is effected in time thanks to the palletizer, but "by hand" piece by piece. In the afternoone, the pieces are loaded on the pallets to function automatically. At night, an average of 50 pieces are machined wihtout manual intervention, each pallet being capable of receiving up to six identical pieces. For Ewald Sprissler, the operation's balance sheet is positive: "We thought we'd amortize the investment in less than 3-½ years. Above all, with two machines, we have reached production equal to 3-½ conventional machines."

It was a step-by-step process: first, by putting the machining stations into service without the palleting system, in order to eliminate the little problems of the machine itself (the cover's sealing quality and the development of the software): next, by choosing nine types of pieces to machine at night, mainly molds, rings, tool-carriers, parts that are neither too delicate nor repetitive (series of 500 to 600 units) and are capable of being machined by the 50 tools of the changer.

The manufacturer also had to prepare and verify all the digital command programs loaded into the memory of the machining station's minicomputer.

Another point was considered important: tool control. An operator must take apart, inspect, and adjust the 50 tools every morning. "As soon as we have more experience in the operation, we can enter into a memory the real-life durability of the tools and so program their replacement," states Ewald Sprissler.



Système TMS en service chez Trumpf. Les tôles sont transportées automatiquement du magasin aux poinçonneuses par des chariots guidés par fil.

TMS system used by Trumpf. The metal sheets are transported automatically from the storage racks to the punch presses by wire-guided carts.

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BRIEFS

ALUMINUM PROCESS TO JAPAN--French technology transfer to Japan: Mitsui Aluminum Ltd. has just acquired the license and Japanese rights for an aluminum refining process developed by Pechiney Aluminum at the Voreppe research center and perfected at the Mercus (Ariege) factory. This process, called "by segregation" controls and crystallization of liquid aluminum and reduces the amount of impurities to less than 10 ppm. It replaces the traditional (very energy expensive) process which consisted of applying a second electrolysis to the metal. This quality of aluminum (10,000 tons produced in France per year) is mainly used in making electrochemical condensers. From a Japanese base, this operation could bring 10 million francs per year to the French company. [Text] [Paris L'USINE NOUVELLE in French 22 Apr 82 p 63] 9939

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MITTERRAND AT VERSAILLES: TECHNOLOGY, EMPLOYMENT, GROWTH

Paris LE MONDE in French 7 Jun 82 p 2

[Text] We are publishing below lengthy excerpts from the report "Technology, Employment and Growth," presented by Francois Mitterrand at the Versailles summit conference on Saturday morning, 5 July.

First of all, let us look at the facts.

In a world in crisis, our seven countries have not been spared. Nor are things getting better. Since the Ottawa summit conference, 5 million men and women among us have lost their jobs. Production, investments and trade stagnate, protectionism poses a threat, there is confusion in our currencies and interest rates have reached levels preventing any creative growth in employment. Selfishness has become the rule.

In the southern countries, conditions of survival have deteriorated: Nearly 30 million human beings are starving to death.

And yet, if one takes a good look, the balance sheet for this year is not totally negative and more encouraging signs exist: Inflation is slowing up, productivity is increasing and in some countries, including my own, growth has resumed and unemployment is no longer on the rise.

Let us now look further ahead: The future depends on our political will. The crisis can be overcome if we believe in our own future, if we reject the fatalistic view that sterilizes countless talents and creative abilities, if we join our efforts (...).

The crisis goes beyond borders. It is therefore only by joining together that we can master the changes of which I speak, that we can prepare for the future.

If we were in an ideal world, the international monetary system would be stable, protectionism would be banished, every nation would trade with others on a balanced basis, no monopoly would oppose competition, interest rates would be low and the North and the South would join their efforts to expand their cultures and freedoms. Thus we would have the economic conditions adapted to the development of a strong alliance. Our common action would be easy to define.

That is not the case today. That is why we are reflecting on the means to organize balanced growth, to reduce unemployment, eliminate protectionism, build a stable monetary system and give the South the means for its development.

In the meantime, must we be content with an admission of impotence? Of course not. That would be a hasty, mistaken course. Not only do we have the duty to examine the problems posed by the crisis -- first agreeing on its nature and causes -- in order to solve those problems, but we must explore the vast fields open to our common efforts. Among them are those offered by science and technology, whose rapid evolution entails upheavals in our societies and the risk of turning against man himself on whom those societies are based if man does not master that evolution.

Many private and public enterprises in all of our countries have already taken up this question. France is involved. But if we perceive the stakes of the industrial revolution now beginning, are we sure that we have all the trump cards in our hand? The most important one is lacking, the only one that would give us coherence and solidarity in our action. I ask you to think about it.

Vital Thrust

Where is technical progress today and what can it change about the crisis in which we find ourselves over the next 10 years? For the past 5 years, progress has accelerated in biotechnology and electronics. New fields appear to be unlimited: time, space, living matter.

1 -- Biotechnologies should eliminate hunger, disease, overpopulation.

Tomorrow, the joint use of biochemistry, microbiology and genetic engineering will permit the industrial use of microorganisms and transform entire economic sectors, not only chemistry and medicine, but food and energy as well (...).

2 -- Electronics will increase production capacities and the creativeness of our economies.

Microelectronics, the new compounds and optical fibers will bring about profound modifications in old industries (telecommunications, transportation, mechanics) and will create new ones (robots, data processing).

That is already the case. In 10 years, the capacity of integrated electronic circuits has been increased 100 times and their cost divided by 1,000. This progress will become even faster (...).

3 -- Energy means will evolve rapidly over the next two decades.

4 -- Finally, new dimensions will be offered to man's intelligence.

(Here, Mitterrand cited a few examples: oceanography, space exploration, which will increase means of communication. He continued.)

With these new communication technologies, another form of civilization is being established. The proliferation and interdependence of electronic systems of information will act on our daily universe, our modes of relations, our systems of values. In 10 years, there will be several tens of millions of personal computers.

Immense Reservoir of Human Intelligence

In the face of these upheavals, the wait-and-see attitude or egotism would accentuate disturbances, annoyances, violence, imbalances, conflicts. Everything must be done in each of our countries through wide-ranging economic cooperation so that progress will constitute a means of peace and prosperity, in order to prevent its producing unemployment and recession, as it has in the past. I would propose five topics for reflection and action.

1) Creating full employment by mastering the type of work.

Technological progress cannot be disseminated in a context of unemployment, which creates a pessimistic environment, causes people to withdraw, destroys confidence. That is why the struggle against that evil, through our concerted economic policies, is a priority.

Some fear that progress might worsen the unemployment striking us. Having reflected on this, I can tell you of my optimism in medium-range terms (...).

By 1990, 20 percent of all mass production will be done by machines, reducing the number of jobs, particularly the heaviest ones in industry. Tertiary activities, such as banking and insurance, will also be affected. Overall, several million jobs could be eliminated between now and 1990 in the industrialized countries alone.

We must therefore have the means of handling the change so that technology does not do away with jobs faster than it creates them. We must shorten the time of that inevitable transition.

If we prepare for it, the new technologies will create as many or more jobs than they eliminate, not only through the production of new industrial goods, but also through associated services (distribution, engineering, advice and consultation, training, leisure activities), provided that we know how to organize them and through the spinoff that will take place in sectors such as iron and steel, mechanics, chemistry, and so on.

The problem facing us is therefore that of an ordered, rapid substitution of new jobs for old ones. I shall later make suggestions on this subject.

This substitution cannot only be quantitative. It will be accompanied by a profound evolution in the content of work and its organization. It will give another meaning to the reduction in time spent at work (...).

In this connection, I believe that three lines of action are imposed on each one of us:

a) support for demand in order to encourage the development of markets for new goods and services incorporating technological progress;

b) the stabilization of interest rates and rates of exchange. I shall not insist on this point because it will be the essential subject of the rest of our discussions.

c) an increased effort in the area of professional training and mobility. The organization and content of work will be determined, as I have said, by the dissemination of new techniques. Exercising several trades during one's lifetime of work will be one of the major characteristics of our societies in the years to come.

2) Promoting industrial vigor

The bases for departure exist. It is possible to overcome the recession, to break the downward trend of gains in productivity and to open up new markets (...).

The rapid automation of industrial production should bring about gains in productivity of over 10 percent a year, an indispensable conditions for the success of anti-inflationary policies.

Conditions for a new industrial vigor must exist in order for this to happen: an investment effort and guaranteed competition.

a) Relaunching the industrial investment effort

The so-called austerity policies check technological progress by discouraging investments that in the long run create a new demand, when we must respond to the technological revolution by encouraging private and public industrial investments.

It is an unprecedented mobilization of capital toward industry and research that we must bring about (...).

b) Guaranteeing competition

Competition is an essential factor of growth and technical progress. However, it will pose problems very different from those we know today.

In the field of biotechnology, for example, over one-third of the finished products are made by firms that have a world monopoly and the imbalance is only going to grow worse. Likewise, in the field of advanced electronics, eight firms already control 70 percent of the integrated circuits market. This concentration will increase.

And yet, technological innovation essentially remains the field of small and medium-size private enterprises and this is fortunate.

3) Fighting the North-South imbalance

Finally, we must put the recent technological discoveries at the service of the southern countries. As I already stated with respect to biotechnologies, these discoveries will help to reduce their energy and food dependency.

Naturally, we cannot conceal the fact that they will also mean new threats, instabilities and dependencies (...).

Not only must we reflect on the means of transferring our technologies to them by adapting them, but we must bring together the conditions permitting the emergence of technologies directly based on their own circumstances. Only on this condition is the autonomous development of their agriculture, industry and services possible (...).

4) Overcoming temptations to withdraw

While world trade has slowed down, products incorporating high technology occupy a large portion of its volume. We must overcome this contradiction.

Technical progress will create new opportunities for trade. But protectionism finds in the very nature of highly technological products new means of expressing itself (standards, procedures of approval, and so on). Technological development on the whole can soon give rise to reactions of withdrawal, the desire for isolation, which in the long run can harm the interests of all nations. We must cooperate so that protectionism will not prevail.

5) Building a new civilization

A new civilization begins where the multiplication of means helps to free men from the double limitation of time and distance, to trade, communicate (...).

The stakes are there and they are immense, for in the absence of a powerful movement of trade, a risk of uniformity weighs on all cultures and languages.

Communication is in fact concentrated in all countries. Some firms take control of all systems needed for electronic dissemination. By mastering them, they influence the traditional media: movies, the press and television. The essential new activities in which most firms are involved (the production, storage and processing of information) presumes very heavy investments, leading to heavy concentration (...).

Concerted Development of World Economy

And now what is to be done? I hope that we can reflect together on a series of measures that can rapidly put the principles I have just outlined in practice in our countries.

It is not that I am asking you to decide today, but in the year ahead, we can at least launch the indispensable common action.

Otherwise, each one will withdraw, the trade battles will worsen and protectionism will again prevail. No one will gain anything.

The past proves the reality of these dangers. At the time of each of the two previous industrial revolutions that the West has experienced, there was an initial rise in unemployment, protectionism and inflation (...).

Then, in the better prepared countries, a second phase brought the victory of the social forces for change. Growth and stability returned and investments resumed.

If we are not careful, we shall now risk witnessing the same succession of events: The new industrial revolution has begun to worsen unemployment, inflation, financial difficulties and inequalities. This will last a long time if we do not decide to put an end to it.

Despite differences in view separating us, none of us can be resigned to this (...).

(Mitterrand then makes three proposals.)

1) Launching a Concerted Program of Growth Through Technology

Six main guidelines will constitute a broad path for us to follow:

a) Overall objectives: setting percentages of the GNP for 1982 and 1990 and exchanging views on national policies of research-development, completing them, if need be, by sectorial objectives and taking advantage of work already undertaken in international institutions, particularly the OECD.

b) Priority actions of technological cooperation between private and public firms and between nations.

For every project chosen, a development committee could be set up. It would include the organizations concerned from participating countries. A minimum investment effort by country would be established.

c) Innovation must be accelerated in all forms by developing useful procedures (Mitterrand deems it necessary to facilitate the establishment of new enterprises).

d) Gradual establishment of a world market for technology (standards, patents).

e) Joint measures in order to assure southern countries of the mastery of new technologies.

(Mitterrand favors the conclusion of a co-development agreement here).

f) Finally, we must stabilize the international monetary system as soon as possible for its unpredictability checks investments. In order to do so,

we must seek out the ways and means of strengthening balanced monetary cooperation between the three European, American and Japanese poles with a view to a return to stable and economically correct exchange rates.

2) Placing Technology in the Service of Employment and Working Conditions

a) Setting up a vast arrangement for training in connection with changes in jobs in order to accelerate the transition from the industrial revolution. For this purpose, we must:

Starting in 1983, organize in each of our countries and with the methods characteristic of each, a specific arrangement for training in new technologies such as data processing, biology and new trades (telecommunications, life sciences, engineering, leisure activities), based on the following three guidelines: priority for the training of engineers and technicians; training for unemployed young people between the ages of 16 and 18; and conversion to new technologies for workers already employed (...).

b) We must also take advantage of the new technologies in order to improve working and living conditions.

Before the next summit conference, a program must be set up to evaluate positive and negative experiments in the cities and the effects on urban living of technological changes such as wiring, new means of transportation and housing.

3) Promoting the Expansion of Cultures Together

a) Education: making a joint effort to define systems of education adapted to each country; drafting a family of simple data processing languages on a world level; and acting together to develop the use of computers in the schools so as to train young people very quickly to use the everyday objects of the future and those involved in their future trades.

b) Communication and languages: Development of education and research in the field of languages and communication is indispensable in order to resist the powerful movement of standardization of which I spoke. We could: establish a world system in the UN University connecting all centers of education, training and research devoted to languages and communication. This network would facilitate the development of the following actions in the countries concerned: the study of languages, the role of national languages in the dissemination of technologies; and starting a great encyclopedia of all the cultures of the world.

c) Charter of Communication: I believe that negotiations should be done by phases in the international organizations in order to draft a world charter of communication, which is now so difficult. It could be organized around five major principles: ensuring respect for the diversity of languages; promoting the coordination of legislation on information, intellectual property, contractual law and the protection of individual freedoms; encouraging the drafting of rules for international exchanges of data; protecting the

sovereignty of nations and their cultural integrity, which is threatened by new technologies; and guaranteeing southern countries the means of mastering their means of communication and the messages they carry.

d) World exhibition for a "present image of the future": Here, it is a question of illustrating the role of technological development as a factor of bringing peoples closer together.

France would be ready to organize such an exhibition in 1989.

Before concluding, I wish to spell out the conditions for the concerted implementation of the proposals I have just put to you:

A working group of eight prominent individuals set up by us immediately following this summit conference would have the mission of defining priorities based on the proposals contained in this report of your discussion.

The group would work with competent international institutions, particularly the OECD, and would present its report before 31 December.

The conclusions of the report and the actions resulting from it would be examined at the next summit conference of industrialized countries to be held in the United States in 1983.

(Mitterrand concluded by saying that "in tackling the problems that assail us and by accelerating their solutions," we shall "provide our nations with the essential thing: confidence in themselves.")

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SCIENCE POLICY

MINISTRY OF RESEARCH, TECHNOLOGY: FIVE NEW STUDY MISSIONS

Paris INFORMATIONS CHIMIE in French Apr 82 p 103

[Text] A second wave of five study missions has just been launched by Mr Jean-Pierre Chevenement. These missions follow up on a first series started last August (biotechnology, rational use of energy and new energy sources, robotics, research into employment and working conditions, and scientific and technical cooperation with developing countries).

The "mechanics" mission has been entrusted to Mr Jean Persuy, president and general director of Saunier-Duval, which will set the objectives and the means of attaining them and will work in close collaboration with the robotics mission. The "materials" mission is directed by Mr Jean-Pierre Causse, general director in charge of research at Saint-Gobain. This mission will set priorities in this key area in which progress affects the competitiveness of many sectors (automobiles, construction, aeronautics, electronics and information processing, instrumentation, etc.). The "chemical" mission will have several problems to study: reducing dependence on foreign supplies by expanding production of high added-value products, and meeting the needs of "downstream" industries--the electronics industry, high-technology materials, and human and animal health, where performance depends on progress in chemistry. This mission will be directed by Mr Pierre Fillet, science director at the Rhone-Poulenc Company.

The "living habitat" mission, led by Mr Claude Pierre, will study the sector's general research needs, examine the spread of new construction technologies, and set directions for developing new building materials, work procedures, savings of rare materials, etc.

Finally, the mission "technology, cultural communication, and communications" will be headed by Messrs Armand Mattelart and Yves Stourdze. It will evaluate research in communications problems, define the problems posed by the evolution of communications systems, make suggestions for reforms of existing structures, etc.

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DRAFT RESEARCH BUDGET FOR 1983 PREPARED

Paris LE MONDE in French 7 Jun 82 p 7

[Article by Maurice Arvonny: "A New Approach and Anxieties"]

[Text] The ministry of Research and Technology is using a new arrangement by programs in drafting the 1983 budget. This financial reshuffling of the various research agencies within a single ministry makes it possible to prepare the budget by programs rather than agencies even though it is necessary afterwards to allocate the funds to the agencies.

Each agency was asked to present its requests according to a single chart with 14 headings: 7 general programs[1]; basic research; finalized and applied research; 4 programs of technological development[2]; and an "indirect funds" category covering real estate operations, information processing, etc., and other expenses that cannot be itemized under one of the foregoing categories.

The agencies' requests are put together in a table reflecting what the ministry wants to have allocated to research, jobs, normal expenses (essentially salaries), payment credits and program authorizations.

Normal expenses came to Fr 12.7 billion in 1982. The 2,575 new jobs planned for 1983 (if the principle of a 4.5 percent a year increase is adhered to), announced or foreseeable legislation, and a few international commitments should cause an increase of Fr 16 billion approximately or a volume increase of 12.7 percent with allowance for drift in currency values. Since 1982 program authorizations equaled normal expenses, an overall increase of 17.8 percent should carry over into an increase of about 23 percent in capital expenditures (program authorizations and payments on account).

By categories, the table shows a volume increase of 13 percent for basic research expenditures--a figure appearing in the appendix to the bill on general planning and programming, which will come up in the National Assembly on 21 June. The ministry wants to keep technological development programs from growing faster than research in general (17.8 percent). Considering the amount of money involved, this should lead to increases of 20 percent for finalized research and 25 percent for the general programs, which should benefit anyway because of their priority status.[3]

If the 1983 draft budget is to get off the drawing boards, the 17.8 percent volume increase must be made official by memoranda from the prime minister in mid-June putting ceilings on expenditures. The bill sets an average annual rate of increase, which is a term that did not appear in the initial drafts of the bill; the Budget ministry would be glad to conclude from it that it is quite possible to start at a slightly lower figure with the intention of catching up with the average rate of increase in the following years. However, in Mr Chevenement's cabinet, the opinion is that if this rate of increase is not reached in 1983 it won't be in 1984 or 1985 either.

Another foreseeable difficulty is the losses of CIL-Honeywell-Bull. Will about a billion francs be allocated to the civilian research budget on the excuse that the budget used to have an "information-processing plan" and that it now has a general "electronic network" program? That would throw the whole business out of balance. There too, those about Mr Chevenement say that research should not be confused with industry, and they refuse to put into the research budget anything that does not have to do with research.

Research--and its fallout--benefited from a high budgetary priority in 1982, even though budget regulations (see the following article) did somewhat dampen its momentum. Mr Chevenement has managed to clear the air in research organizations what were deeply scarred by the "lean years," and this improvement is due in large part to this high priority. It is one of the keys to mobilizing researchers towards the objective of "getting out of the crisis," which was a major theme of last winter's national colloquium. If this new priority seemed to them to be no more than a flash in the pan, untoward consequences might arise.

FOOTNOTES

1. Rational use of energy, biotechnologies, electronics network, cooperation and the Third World, jobs and working conditions, scientific education and promotion of the French language, technological development of industry.

2. Electronuclear power, space, civil aeronautics, oceans and marine technology.

3. The general 1982 budget figures (normal expenses plus program authorizations) are as follows in billions of francs: general programs, 5; basic research, 8.1; finished or finalized research, 2.4; technological development programs, 6.6; indirect funds, 3.3. The Fr 25.4 billion of the civilian budget are supplemented by Fr 18 billion for military research and development, Fr 6 billion for university research, and Fr 3 billion for telecommunications research. Business will probably finance research out of its own funds at a rate of Fr 30 billion, half of which will be contributed by national companies.

[Article by Maurice Arvonny: "Blocked Credits"]

[Text] Preparing the 1983 budget is one thing, implementing this year's budget is quite another. It started out great, but the government asked all ministries charged with expenditures to hold 25 percent of their capital expenses in reserve, to be released theoretically after 1 October.

The ministry of Research was hit as hard as the others, although it did obtain some adjustments. In particular, this "regulation" does not hit program support--a little less than Fr 2 billion, which shows up in program authorizations to provide management flexibility and are very closely tied in with laboratory operation. Also exempted were some organizations involved in multi-year equipping programs. Thus, the amount of blocked funds comes to less than Fr 1 billion.

But many "small" equipment expenditures are being delayed. The freeze is thus affecting the work of many researchers, and this increases its psychological effect. If the money is not released, or if it is released too late to be spent usefully, mightn't the science staff get the impression that promises made to them have been broken?

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USE OF COMPOSITE MATERIALS IN 'AUDI QUARTZ'

Duesseldorf VDI NACHRICHTEN in German 30 Apr 82 p 18

[Text] An objective of automobile manufacturers since before the time of the first oil crisis has been to save fuel by reducing the weight of the vehicle. Now the pressure to conserve exerted by the state is growing at an increasing rate. One solution to the problem of realizing low fuel consumption lies in the use of new materials. The development of the Audi "Quartz" by Pininfarina, as a practical example of this use, was discussed at the annual automobile manufacturers' convention in the VDI Plastics Society in Mannheim.

At the present time, efforts to use lightweight materials are assuming fundamental importance in the automobile industry because of the importance of vehicle weight for fuel consumption. Today, the power-to-weight ratio--previously regarded mostly as a measure of the sporting characteristics of a vehicle--is also considered as an index of economical fuel consumption.

The connection between consumption and weight is, to a large degree, determined by how the lightweight construction is executed. According to Enrico Fumia at the annual automobile manufacturers' convention in the VDI Plastics Society, it is not just a matter of exchanging some materials for others, it is also a matter of adopting new design philosophies which are in keeping with the new materials. He said an introductory phase was emerging, in which the gradual replacement of traditional materials would lead to "hybrid" bodies. Examples of "hybrid" bodies had been in existence for some time. One had only to look at the "soft nose" of cars from the United States, the Porsche 928 and cars with fiberglass bodies. With some exceptions, the parts, which were made with the aid of new manufacturing methods and new materials, had not been created for reasons of weight saving, but for aesthetic-functional reasons. The principal objective had been to solve a technical problem without sacrificing important aesthetic aspects, through the broad introduction of new industrial manufacturing methods for the application of lightweight, mostly nonmetal materials.

A Belt-Shaped Slot Divides the Body

The stylist's job, said Fumia, was to design a sufficiently compact car which did not have any extremely large polished surfaces and few small parts in its equipment.

The doors are also of sandwich construction and consist of a metal-plastic laminate. Two thin layers of steel or aluminum are combined with a plastic core. Together they form a laminate whose characteristics are comparable to those of steel or aluminum.

This product reduces weight by almost 50 percent, compared with a similar body of sheet steel. Its thermal and acoustic insulation properties are also of some interest to the body manufacturer. Shaping this type of material does not require such heavy bending machines or presses for the same thickness; however, strength equal to a normal steel sheet can only be attained with a greater total thickness for the sandwich. But the quantity of steel used was smaller.

From the point of view of the body manufacturer, metal-plastic laminates do have one disadvantage, a disadvantage that is easily overcome: They cannot be welded together. At present it is still necessary to rivet, glue or bolt parts together. For some time assembly using bolts has been the preferred method for front fenders, and combinations of the other methods have frequently been employed for doors and hoods. In these circumstances, the doors of the prototype were also made from steel-polypropylene laminates. The example of the side panel sections demonstrated in particular that this laminate material has good drawability properties. The laminate thickness is 1 mm, with two layers of 0.2-mm steel and a polypropylene core 0.6 mm thick. The material is on the market in the United States. The costs lie between those of steel and aluminum.

Glass is another important factor for the automobile and its weight. Glass is heavy, not least because of the thickness required.

Fumia said that there was a swing toward manufacturing compact cars with a smaller volume. In the same way it could be determined that there was no inclination to reduce the glass area. This was being done apparently to maintain better vision and a cheerful interior.

In order to reduce weight, it was therefore necessary to consider either reducing glass thickness or substituting transparent plastics for glass. To judge by the current state of development, neither of the two directions seems to be favored over the other.

It was still too early to think of installing a windshield with a thickness of less than 4 to 5 mm. For reasons of high transparency and scratch resistance this window was still made of glass.

However, side windows and rear windows could be replaced by plastics, The decision was made to replace the glass in the rear window of the "Quartz," which is also the trunk lid, with polycarbonate (PC). The weight reduction achieved was about 50 percent.

Carbon-Fiber Reinforced Plastic Saves up to 70 Percent of Component Weight

In the handbuild "Quartz," several lightweight concepts have been introduced more from the point of view of a show model than with any regard to the practical application of light materials. The interior of the car has been designed in this spirit,

According to Fumia, these considerations at Pininfarina produced the "Quartz" show model. The primary objective had been to provide a practical example of how the new metal and nonmetal materials could be used.

The originality of the study lies in the fact that these materials have been transferred from airplane construction to automobile construction. Their thinking had been directed not only at racing cars but also at production vehicles.

The result is a body with a belt-like groove separating the upper from the lower part. This groove also functions as a duct for the internal aerodynamics of the engine compartment. Air enters at the front through the slot formed by the groove and leaves the engine compartment immediately behind the front wheel housing.

The body was divided in this drastic fashion to attain the aesthetic impression of lightness. In addition, the body could be manufactured from two independent parts and thus made of different materials.

The front and rear bumpers are of sandwich construction and consist of an outer skin of aramidic-fiber reinforced plastic, with a honeycomb layer in the center.

Because of their low weight and high compressive strength, they can survive a considerable impact without permanent deformation.

The aramidic fiber "Kevlar" had been used, said Fumia, to reduce the weight of the body. Its specific weight of 1.45 grams/cm^3 was low, and its tensile strength of 3,617 N/mm^2 was, by comparison, very high.

The greatest advantages of aramidic fiber were to be found in its extraordinarily high strength-to-specific weight ratio and rigidity-to-specific weight ratio. In addition it had high heat resistance, thermal stability and high resistance to attack by chemicals.

Its ability to damp vibrations was up to eight times higher than that of steel.

Lightweight Bumpers of Sandwich Construction

The cellular configuration of the center honeycomb layer of aluminum or aramidic paper is used in the aerospace industry because sandwich panels can be made from it with a very high rigidity-to-weight ratio and high compressive strength.

Depending on the cell configuration, the material can be manufactured to conform to special curves and can be bent for round covers, flexed parts and cylindrical surfaces.

The center layer of the bumpers is made by forming honeycomb panels, which have negligible weight, to the dimensions of the bumper cross-section.

Aluminum was used as the metal outer skin. The innovation is the metal-plastic laminate.

using lightweight materials and linings. The watchwords of the design that was followed were maximum simplicity and practicality. In addition to the rear window frame, the seat frames were also made of extremely light-weight and durable carbon fibers with epoxy resin as the matrix.

Carbon fibers, whether in fabric form or as a reinforcement in semifinished material obtained by polytrusion, is arousing growing interest in automobile manufacturing. One only has to consider that without sacrificing mechanical strength, it is possible to achieve weight savings of about 70 percent compared with steel, and about 33 percent compared with aluminum. This opens up a wide variety of possible uses, such as drive shafts, engine bearings and springs, among the mechanically stressed parts, or body components such as internal reinforcements, bumpers, door linings and hoods.

The seats and door linings were made from parachute cloth, a much lighter material than that of the normal linings.

The examples of the use of new materials in the Audi "Quartz" are an embodiment of the concept of "light weight" from the standpoint of styling. It will therefore be interesting to see whether the weight reductions on display will find a lasting application when they are closely scrutinized from the standpoint of economy for mass production.

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